

Superior. The most abundant rain fell north of the centre of depression during the passage of the low area. South of the track precipitation did not, in general, occur until the shifting of the wind to southwest or northwest. It was during the passage of this storm-centre that the maximum temperatures for the month occurred in Missouri, Illinois, Tennessee and the Ohio valley. The warm wave gradually extended eastward and southward, giving unusually high temperatures for May over the entire country east of the Mississippi river.

No. X.—At the morning report of the 29th there was a sharp fall in pressure in Kansas and Missouri, accompanied by rain, extending to the West Gulf coast. During the day the storm, rapidly increasing in energy, moved in a northeasterly track into northern Illinois. On the 30th it moved over Lakes Michigan and Huron into the Province of Ontario. At the morning reports the barometers at Chicago, Grand Haven and Milwaukee were more than 0.5 below the normal. Its passage was marked by abundant rainfall, which extended over all the United States east of the Mississippi river. Cautionary Signals were ordered for this storm for all the Lakes, except Superior. The following maximum velocities are reported: Milwaukee, NW. 28; Grand Haven, E. 26; Alpena, E. 28; Toledo, SW. 32; Sandusky, SW. 36; Cleveland, W. 28; Erie, SE. 28; Buffalo, SW. 29; Rochester, W. 26. On the 31st the low area moved over New England into the maritime provinces of Canada with diminished energy. Signals were ordered on the 30th in advance of this storm from Cape Henry to Eastport. The following are the reported maximum velocities: Cape Henry, S. 25; Chincoteague, SE. 37; Breakwater, S. 34; Atlantic City, SE. 25; Barnegat, S. 30; Sandy Hook, SE. 26; Wood's Holl, SW. 40; Boston, S. 28.

INTERNATIONAL METEOROLOGY.

Three International charts, Nos. IV, V and VI, accompany the present *Review*. They are for the months of *April*, 1880 and *September*, 1878. In the introduction to International Meteorology, in the *April Review*, the numbers "IV and VI" should read "IV and V", and "March, 1878," should read "March, 1880."

Chart No. IV indicates the probable course of the principal storm-areas occurring over that portion of the North Atlantic ocean, lying between the parallels of 35° and 60° N., during the month of *April*, 1880. The characteristic features of the weather, for this month, over the region under consideration, are the long continued period of good weather and—if we except the northwesterly gales from the 2nd to the 6th between the British Isles and 30° W., attending area No. I, and the gales from the 13th to the 21st, attending areas Nos. III, IV and VI,—a remarkable freedom from severe storms. Area No. I is a continuation of low area No. XV of the *March Review*. On the morning of the 1st it had passed to the east of Newfoundland, and was encountered, in about 46° N 40° W. by steamers *Braunsweg* and *Hibernian*; during the day it moved rapidly northeastward, and was followed over the Western Atlantic by an extensive area of high pressure (see high area No. I, *March Review*). During the 2nd, 3rd, 4th and 5th, it slowly approached the British Isles as an extensive area of very low pressure; the S. S. *Sardinian*, on the morning of the 4th, in 54° N 17° W, reported barometer 29.14, or 740.1, while the British Isles were included by the isobar 29.35, or 745.4. On the morning of the 5th the pressure at Stornoway fell to 28.79, or 731.3, and during the day the wind, at this station, veered from S. to W. with slowly rising barometer. Except during the regime of the two storms, of minor importance, described as low areas Nos. I and II of *April Review*, and which passed to the north of Newfoundland on the 7th and 8th respectively, high pressures and good weather generally prevailed over the western portion of the Atlantic from the 2nd to the 10th, and over the eastern portion from the 7th to the 11th. S. S. *Adriatic*, from New York, on the 1st, to Liverpool, on the 12th, reported high pressures (except 29.97 on the 6th) and clear or fair weather throughout voyage. During the 10th, as the area of high pressures moved eastward over the British Isles, the barometer fell over the Atlantic to the westward, and on the morning of the 11th low area No. IV appeared to be central about 50° N 25° W. S. S. *Celtic*, in 50° N 23° W, reported barometer 29.70, or 754.4, wind SSW, force 4, and rain-squalls; S. S. *Strassburg*, in 49° N. 16° W, 29.89, or 759.2, SE. 2, light rain. On the west side of the centre, S. S. *Nederland*, in 46° N. 29° W., reported barometer 29.85, or 758.1, wind NNE. 3, much rain, and S. S. *Indiana*, in 48° N. 31° W., 29.97, or 761.2, N. 7, hard rain. On the morning of the 12th, the *Celtic* and *Indiana*, sailing westward, had passed into the area of high pressures, then over mid-ocean and which had moved eastward since the morning of the 8th, from the coast of the United States, while the *Strassburg*, in 49° N. 22° W, reported 29.86, or 758.4, E. 4, cloudy, and the *Nederland*, sailing eastward, in 47° N. 25° W, 29.71 or 754.6, N. 6, rain, high sea and squally. Bark *Woodlands*, in 39° N. 20° W., lost boat &c., during a SW. to W. gale, lasting 48 hours, and SW. to SE. winds, force 3 to 5, had become fully established at the Madeiras and over the Spanish Peninsula. During the 12th, 13th, 14th and 15th, this area of low pressure moved slowly east and northward from the neighborhood of the Madeiras to the coast of Ireland as a somewhat severe storm; Bark *Angelo Madre*, on the 14th, about 200 miles north of the Madeiras, experienced a heavy gale, during which she had her decks swept, and four men washed overboard and drowned. On the 15th S. S. *Nederland* in 49° N., 9° W., reported barometer 29.46, or 748.3, wind NNE. 5, much rain and squally. Area No. III passed very slowly eastward, to the north of Newfoundland on the morning of the 13th, being preceded by S'ly winds, force 4 to 9, between 30° and 45° W., and followed by cold north-west gales, snow and hail. S. S. *Celtic*, in 46° N., 39° W., reported barometer 29.76 or 755.9, SSW. 6, and S. S. *Indiana*, in 42° N., 44° W., 29.74 or 755.4, SSW. 9, hard rain. On the morning of the 14th the pressure still continued quite low, but rising slowly, over Newfoundland, while the winds between 30° and 50°

W., had veered to westerly. On the morning of the 15th, the centre had moved eastward to 30° W; S. S. *Ohio* in 50° N., 25° W., reported barometer 29.88 or 758.0, S. by W. 5; S. S. *Strassburg*, 46° N. 37° W., 29.58 or 751.3, NW. 9, rain and hail showers, high seas, much water on deck; Bark *Syringa*, 46° N., 36° W., 29.80 or 756.9, WNW., fresh gale, constant showers and cross sea. On the morning of the 16th it was central about 20° W.; S. S. *Ohio*, 51° N., 17° W., reported barometer 29.25 or 743.0, SW. 5, while severe NW. to Wly gales and very high seas prevailed from 25 to 40° W.; S. S. *Strassburg*, 45° N., 40° W., barometer 29.65 or 753.1, W. to NW., 9 to 10. Area No. V passed rapidly eastward over Newfoundland on the morning of the 16th. By the morning of the 17th, the centre had passed eastward to 30° W. and by morning of the 18th to 20° W. Bark *Syringa* reported, 17th, 46° N., 29° W., 29.20 or 741.7, W. gale, frequent heavy showers, and S. S. *Britannic*, 18th, 51° N., 23° W., 28.87 or 733.3, NW. 6, squally. Area No. VI moved eastward, to the south of Nova Scotia and Newfoundland, during the 18th and by morning of the 19th was central to the southeast of the latter; S. S. *Strassburg*, in 43° N., 51° W., reported barometer 29.67 or 753.6, S. 2. By morning of the 20th, this area had moved rapidly northeastward and was followed over the western Atlantic by the area of high pressure described in *April Review* as area No. VII; the barometer on board the *Strassburg*, 43° N., 55° W., had risen to 30.23 or 767.8, with clear weather. On the 21st the area of low pressure passed northeastward between the British Isles and Iceland, and high pressures covered the ocean, west of the 30th meridian. Thence to the end of April the area of high pressures moved slowly northeastwards towards northwestern Europe, until on the 30th, the pressure over the British Isles reached 30.50 or 774.7. Areas of low barometer (Nos. XII and XIII of the *April Review*) moved eastward over Newfoundland on the morning of the 24th, and the afternoon of the 27th, respectively, but passed thence to the northeast without materially affecting the weather to the southward.

Chart No. V shows by isobaric and isothermal lines the mean pressure and temperature, and by small arrows the prevailing direction of the wind, at 7:35 a. m. Washington mean time, over the Northern and portions of the Southern Hemisphere for the month of *September*, 1878. The barometer observations have been corrected for temperature and reduced to sea level. At stations lying outside the area included within the lines, and for those in the Southern Hemisphere, the means are shown by figures indicating the temperature in degrees, Fahr., and the pressure in English inches. Upon comparing the distribution of atmospheric pressure for the present month (*September*, 1878,) with that for the preceding month (*August*, 1878,) the most marked changes are found to be a decided increase of pressure over the entire area included between the parallels of 30° and 60° N., and extending from 140° W. eastward over North America, the Atlantic Ocean, Europe and Asia, and a decided fall at all stations over the Atlantic Ocean to the north and south of those parallels. The increase of pressure referred to above amounts to about 0.10 inch over the small portion of the Pacific and over the eastern half of the Atlantic, from 0.10 to 0.20 over the eastern half of North America and western part of the Atlantic, about 0.15 over Europe, and from 0.20 to 0.35 over the interior of Asia. Over Hindostan, along the coast of China, and at Tokio, Japan, the increase is quite small, and at Chittagong and Nagasaki, near the southern, and at Nikolaievsk on the Amoor, near the northern margin of the zone of high pressure, a small decrease is perceptible. The most marked decrease of pressure over the Northern Hemisphere is found to the north of the British Isles, the area being bounded on the south by Sandwick, Vestervig and Stockholm, and on the east and west by Archangel and Godthaab, respectively. The decrease amounts to 0.33 inch at Stykkisholm, 0.26 at Thorshavn, 0.24 at Tromso, and 0.19 at Haparanda. The observations at all stations over the Atlantic south of 25° N., namely, Freetown, Sierra Leone, Porto Praya, Cape Verde Islands, Paramaribo, Guiana, and those in the West India Islands, show a decrease amounting to about 0.03 inch at the three former, and from 0.05 to 0.08 at the W. I. stations.

On chart No. VI are traced the paths of 24 of the principal storm-areas which traversed the northern hemisphere during the month of *September*, 1878. They fully represent the two great classes of storms experienced over the northern hemisphere, namely, those moving in an easterly path to the north of the 40th parallel, and those having the characteristics of tropical cyclones. Of the latter there are six, namely, Nos. II, X and XXI, to be found over the western portion of the Atlantic, and Nos. IV, XI and XV over the western Pacific. The tracks over the Behring Sea region are based upon reports from St. Michaels, (7 daily) St. Paul's Island, (3 daily) and Unalaska (3 daily); and those over Hudson's Bay and Greenland upon York Factory, Schr. Florence (in Northumberland Inlet,) Godthaab and Stykkisholm.

TEMPERATURE OF THE AIR.

The mean temperature of the air for the month of *May*, 1880, is shown by isotherms on chart No. II. Compared with the average mean temperature of the past eight years for the month of *May*, the means for the present month show a uniform excess ranging from 3° to 7° over the entire country east of the Rocky mountains, except in Florida, the Canadian Maritime Provinces, and North and Southeast Rocky Mountain slopes, and a decided deficiency over the Western Plateau districts and North Pacific coast regions. In California the mean for San Francisco is $1^{\circ}.1$ above normal, while those for Sacramento and San Diego are about normal. As will be seen on examining the table of comparative temperatures given on chart No. II, the excess is greatest in the Middle Atlantic States, where it amounts to $7^{\circ}.4$, and the deficiency greatest in the North Pacific coast region, where it is $3^{\circ}.8$.

The following notes regarding the unusual high temperatures of the month are of interest: St. Louis, 8th, heat intense, one sunstroke, fatal; monthly mean temperature 4° above the average for several years.